Chapter 3: Character-Defining Features

> It is of the highest importance that the artillery organizations be encouraged to take pride in their guns and emplacements. Everything in and about the emplacements should at all times present a spick and span appearance.[1]

Looking at the remnants of the fortifications that once protected the entrance to San Francisco Bay, it is difficult to appreciate what they once were. Slopes that were crisp and groomed a century ago are now muted by erosion, unplanned and untended vegetation, and a web of trails. The massive concrete emplacements are separated from their view of the sea by walls of trees, and their once-trim parapets and traverses are marked with crumbling concrete as well as the free expression of a thousand sentiments from hands that wielded an equal number of spray-paint cans. Wooden doors are shattered, steel doors are shredded with rust and corrosion. Some structures have disappeared altogether.

The atmosphere of neglect disguises one of the nation's most complete and compact representations of coastal fortifications. Pushing aside the effects of contemporary indifference reveals a rich pattern of military architecture. Coastal fortifications were once a keystone of national defense, and both treasure and talent were invested in their construction. The character of the defenses between the 1870s and World War II finds expression in the selection of location and sites, the choice of materials used in their construction, and the manner of their design. The location of the defenses moves from close to the water and harbor entrances, to distant from them. Concrete becomes the preferred building material, wholly displacing the earlier preference for brick and stone. The plan of the batteries shifts from two guns side by side in a single emplacement, to two guns each in its own emplacement—separated from the other by hundreds of feet. The design of individual structures migrates from simple storage to sophisticated specialization.

Most discussions of character-defining features have as their orientation the conventional structures of our community, the commercial buildings and private dwellings that make up our cities and towns. In these structures, the idea of materials, craftsmanship, decorative details, and interiors have a familiar vocabulary because we encounter these buildings every day, and we come to know what to expect in similar buildings. We also know that architects design with such qualities in mind. All of these aspects of character-defining features disappear when we turn to fortifications. Their forms are architectonic rather than architectural, and we need to look carefully at their use and history to determine the unique nature of their distinctive qualities.

Location and Site

Principal Character-Defining Features

Since coastal fortifications were built to mount artillery, the location of the gun batteries was affected by the range of the armament. The ordnance available in the 1870s had a range that was short, and thus the batteries built at the time had to be close to the water. They also had to be close to the narrowest area of the harbor entrance. As the range of cannon increased, there was greater flexibility in where the fortifications could be located.

Change Over Time

The guns mounted in the 1870s had a range between 4,200 and 5,000 yards, and as a result they occupied sites that were close to the shore. The engineers could not afford to sacrifice any of their ability to cover a water area by choosing locations that might be better from the point of view of construction or protection. Typically, the batteries of the 1870s flanked a waterway in a long line, in a fashion reproduced by West Battery and East Battery, or as a defended point such as Ridge and Cavallo Batteries. The locations in

San Francisco were notable in that they were very high; on the north side of the Golden Gate, Ridge Battery and Cliff Battery occupied positions more than 400 feet above the sea.[2] These were enviable positions from the point of view of the defenders, giving them the ability to fire down on hostile vessels. Batteries at lower elevations (although no site occupied in the 1870s at San Francisco could be considered low) had to do with bombarding the ships from the sides, the above-water hulls being more difficult to penetrate.

The locations selected for the construction of the 1890s (and later) often duplicated—and therefore displaced—the locations chosen for earlier works. Distance from the shore was less of a consideration—the maximum range of heavy guns had increased to about 12,000 yards with an expected "working" range of about 5,000 yards—but the sites occupied by earlier batteries were still desirable because, given the topography, they were the right ones. Height remained the defenders' best ally in implementing the recommendations of the Endicott Board. Thus Battery Spencer occupied the location of Cliff Battery, Batteries Marcus Miller, Cranston, and Godfrey obliterated most of West Battery, and Battery Yates found its place on top of the Cavallo Battery outwork.

Another aspect of location, as a character-defining feature, had to do with a weapon that was one of the strongest elements of the defense. Submarine mines were powerful deterrents to an attacking fleet, so mine fields were carefully located on both sides of the harbor entrance. Electrical cables connected the mines to the shore, and the mines could be exploded electrically at just the right moment. The mine fields needed protection, and some batteries occupied locations chosen for their view of the mine fields rather than positions from which they could bombard vessels. Batteries Duncan, Yates, Slaughter, Sherwood, Blaney and Baldwin, in conjunction with other batteries at Fort Mason and Fort McDowell, overlooked the interior mine fields, and together they created an internal corridor to the defenses that did not before exist. Their positions east of the Golden Gate reflected the importance assigned to the mine defense. Seaward, batteries of 6-inch guns at Fort Scott and Fort Barry occupied positions where they could defend the minefields west of the harbor entrance.

Locations for the mortar batteries also reflected the particular aspects of this artillery weapon. Batteries Howe-Wagner, Stotsenberg-McKinnon, and Alexander were placed well back from the shore because the mortars had a minimum range; locating them too close to the shore would create a gap in the defended water area. In addition, the engineers preferred to locate a mortar battery behind a large hill or elevation that not only obscured the battery from view, but also provided it with substantial protection from naval bombardment.

The batteries of the 1890s began a trend that continued to World War II: the spread of the defenses to the north and south to locations that could support the defenses in the immediate vicinity of the Golden Gate. Fort Miley, the first of these specialized posts, occupied a position that denied a sheltered location from which vessels could attack the batteries farther north. The spread of the defenses was an indication that geography could hinder as well as help. The same geography that gifted the engineers with high elevations also presented them with a difficult problem in coast defense—defending a port that was essentially a gap in an unbroken coastal scarp.[3]

By the advent of World War II, the range of the guns had increased to more than twenty-five miles, and the location again reflected the change in technology. Gun batteries pushed further outward, as did the proliferating numbers of fire control stations now required for the long-range cannon. With weapons so powerful, there was no consideration of their position in regard to the shoreline. Instead, location was a matter of selecting the best site to make the most of the guns to be mounted there. Location in this period also reflects an increased desire to take advantage of existing terrain for added protection from the air, a new and more deadly form of assault than that offered by the warships that were the targets of the coast guns.

In addition to the geographic location of the batteries, their character was also defined by changes to the sites themselves. In the 1870s and through the Endicott period, the site improvements were often not much more than a cleared space or road to the rear of the battery. This feature was often identified as the battery parade, a space used to form up the artillery detachment before it took to the guns, but it was also used as a means of point-to-point communication. East Battery retains its parade as a path used by visitors today. Battery Spencer features an approach road that is a covered way, a conventional feature of much older fortifications. Roads and parades were often surfaced with crushed rock or brick, or compacted clay. Gutters and drains trimmed the edges.

The areas in front of Endicott and Taft works were graded flat with a slight angle of depression that continued the concrete slope of the battery. Although distinct angles in earth were discouraged in the 1890s as potentially giving away the location of the guns, Cavallo Battery was a complete exercise in earth shaping. The site and the structure itself were made of the same material, and at its completion, it appeared to emerge from the earth with a symmetry and regularity that made it immediately distinguishable from its surroundings. The sites of batteries built during the period of air power display the great attention that was devoted to duplicating natural land forms. The splayed emplacements of Battery Townsley are an effective demonstration of the care that was taken to work the construction into the landscape when regularity might otherwise reveal its position. Wherever possible, the site was carried over the work through camouflage. Roads in this period did not so much connect the elements of the defense as they led past them.

There were other site features of smaller scale. Stone retaining walls survive at Battery Blaney, and the right wall of Battery Crosby extends as a retaining wall. The lightly-built structures of the Endicott-Taft fire control systems were given a degree of protection by modifying the construction sites with a depression or surround of earth. The early battery commander's stations for Saffold and Godfrey are indications of these practices.

Construction Materials

Principal Character-Defining Features

Construction materials exhibit the adaptation of common materials to the specific requirements of military architecture; the techniques of construction exhibit a high degree of craftsmanship, and in the case of concrete, a growing understanding of how the material can be used.

Change Over Time

The defenses of the 1870s were distinctly different from those that had preceded them as well as from those that followed. They were built largely of earth, and viewed today, they appear to be sculpted from the surrounding terrain. That is a deceptive vision. Earth was the material that was used in the greatest quantity, but it was earth placed over and around armatures of brick, concrete, and stone. The traverse magazines were concrete or brick rooms covered in deep banks of earth; emplacements featured granite blocks to support the heavy muzzle-loading cannon. Brickwork faced the parapets and the entry to the magazines. These other critical building materials were disguised by the mounding of earth around the structural elements, and today they have become further obscured by lush plant growth.

Earth was the natural choice for a number of reasons. As presented in almost every overview of the history of fortifications, the American Civil War demonstrated that the age of the masonry fortress had passed, to be replaced by earthworks that could better absorb the force of the more powerful ordnance then arriving in arsenals throughout the world. They also could be built and repaired more easily. Earth remained the best choice in the 1870s for another reason—military technology was moving forward rapidly, and it was difficult to know what to prepare against. The defenses built by the United States at

that time were intended to be only an interim solution. They would do until the nature of the threat could be better perceived and the capacity of the nation to support a specific type of coast defense was better understood, and the designs of proposed new guns and carriages could be settled upon.

The brickwork in this period formed the round-arched passageways that connected different portions of the defenses. Exposed arch faces were made of common brick that was not sanded to shape; mortar joints were tapered instead. The craftsmanship was at a level equal to other well-built masonry structures, and it has contributed to the generally excellent condition still apparent today (Plate 11). There was little stone. At Cavallo Battery, lintels and sills were of cut granite set into the brick walls. East Battery contains an indicator of things to come. The groin formed by the intersection of two galleries is rendered in concrete, not brick. It is a limited application of the material, and early evidence that concrete was considered simple to fashion into complex shapes, more economical than brick and requiring less skill.

Plate 11. The quality of brickwork in the surviving elements of the 1870s is very high, reflecting both the careful selection of materials as well as the skill of the masons. Cavallo Battery.

Earth remained an essential feature in the 1890s. Each battery was designed to resist the penetration of a projectile, the resistance calculated in so many feet of earth placed in front of so many feet of concrete. In addition to its protective values, earth was graded into the natural contours surrounding each structure (Plates 12 and 13). It remained equally important in later years, as earth cover protected fortifications from attack and observation by both sea and air.

There were some shortcomings. The long side slopes of Batteries Howe and Wagner were made of clay faced with a deep layer of loam, and then planted. Moles and gophers criss-crossed the area with burrows, and in the heavy rains of the 1894-1895 winter, the slopes turned liquid and flowed into the mortar pits. After the exhausting work of removing some 1,000 cubic yards of material by hand and

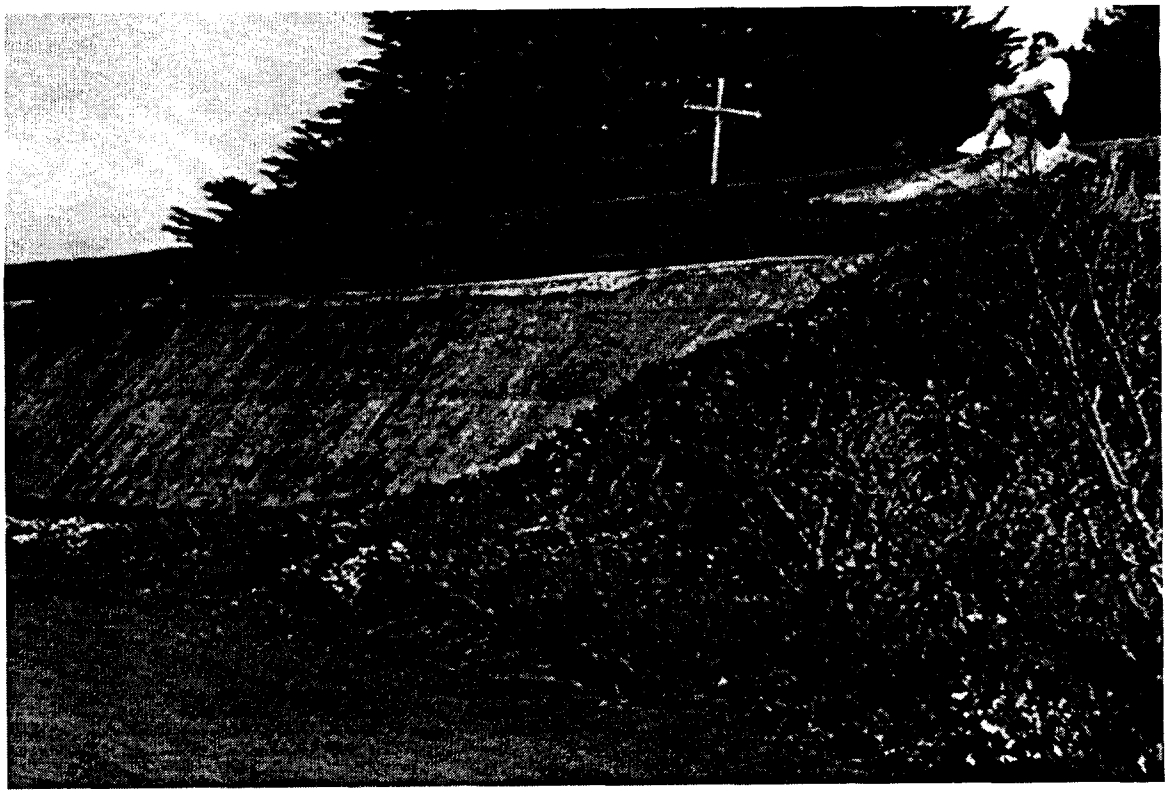

Plate 12. Earth was a critically important component of fortification construction: its loss can distort the intended appearance of a structure. Battery Godfrey.

Plate 13. Earth remained a constant in the fortifications built after the Civil War. Here at the Fort Barry mine casemate, it covered a modern structure of reinforced concrete, rendering that structure invisible to eyes that might view it from the sea or the air.

carried out in pails, the slopes were rebuilt.[4] Landslides in disturbed slopes were not uncommon, and earth would settle in unanticipated ways or not hold the slopes intended for it. The material continues to act in the same manner in fortifications currently held as historic properties. For example, the state of New Jersey recently went to considerable expense to stabilize the earth slopes surrounding a battery at Fort Mott State Park.[5]

Brick and stone were not part of fortifications built after the 1870s. Some defenses on the East Coast retained masonry as a decorative element in concrete or as an anchor for door hinge-pins, but these practices were not incorporated into the works at San Francisco. Concrete was the material of choice for all modern work. It was rapidly replacing stone as a choice in commercial building and paving, and seemed ideal for the type of defenses contemplated by the Endicott Board.

Concrete was the hallmark of the new fortifications, and it made manifest the break with all previous techniques of fortification. The construction of new works of concrete made it clear that the form of American coast defenses had come of age, and the selection of concrete as the material of the future emphasized how tentative had been the system of the 1870s.

The coast defense weapons of the 1890s were more massive, more strongly built, and more complex than any that had preceded them. Guns and their carriages could weigh hundreds of tons, other mechanical devices required electrical power to operate, and electricity illuminated the interior of the emplacements. These new and sophisticated devices required protection from naval weapons that were equally impressive, and they also required a clean environment. These were qualities that concrete could provide better than anything else available to the designers and builders. Concrete was the material of modernity, and fluid shapes of concrete symbolized what was up to date in both civil and military architecture well into the 1940s.[6]

Portland cement was used in all the concrete placed in the defenses of San Francisco. As a result, the fortifications built in the fifty-year period from the close of the nineteenth century to the close of World War II are notable for the quality of their basic fabric. Moreover, they are also distinctive for the finish given the concrete. More than anything else, it is the visible surface of a concrete structure that best expresses the care with which it was built.

Vertical and horizontal surfaces have differing character-defining features. Vertical surfaces often show indications of the formwork or shuttering that was erected to hold the mixed concrete in place until it hardened. Sometimes these features were disguised or softened by parging the surface or sanding it to remove the shuttering marks. Some batteries show several of these features together, as at Battery Marcus Miller. In that instance, the differences in the finish are also indications of a difference in construction sequence, the center part of the emplacement being completed first to allow mounting the gun at the earliest opportunity (Plate 14). Horizontal surfaces were considered walking surfaces and received a different treatment. Often the aggregate was a coarse sand of ground granite used in many paving applications, and it had a look and feel that was distinct. Horizontal surfaces were also marked in flags, the division of the plain surface into regular shapes by narrow grooves pressed into the wet concrete. The purpose was in part decorative, but it was also an aid in drainage and the control of surface cracking (Plate 15).

The nature of finished surfaces changed in the 1930s and 1940s. The methods of building with concrete had altered over the years, and the structures built during that time contain reflections of those practices.

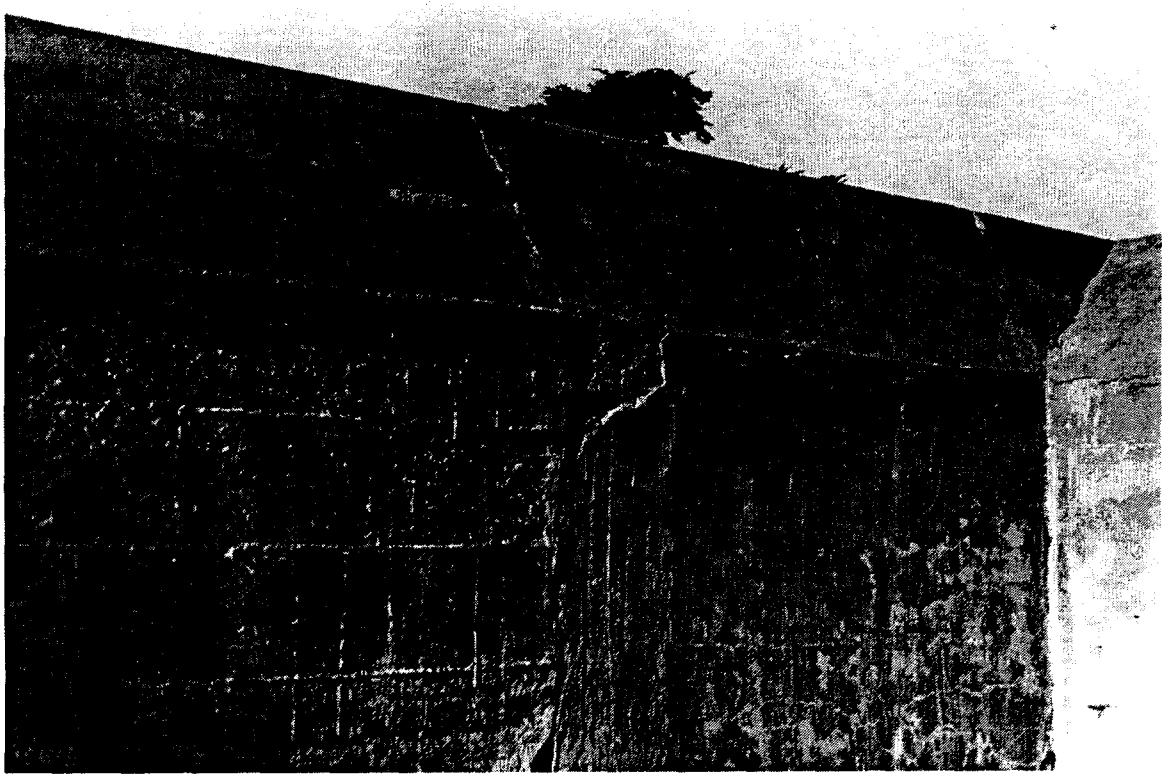

Plate 14. *Concrete* **often retains evidence of how it was placed and finished. Different methods can still be seen today, and are expressions of building history. Battery Marcus Miller.**

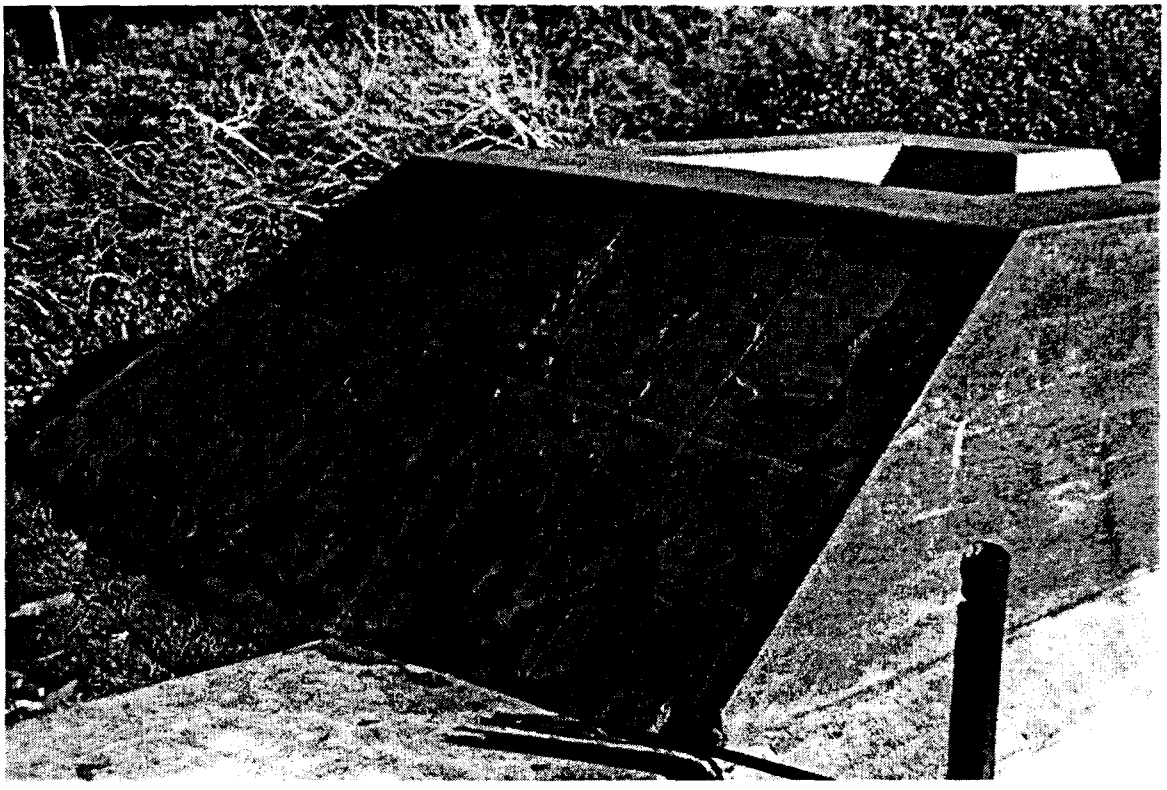

Plate 15. Exposed concrete was often finished very carefully, both for the sake of appearance as well as helping to produce a waterproof surface. Crows nest, emplacement one, Battery Crosby.

Plywood panels replaced the use of individual form boards, and specialized hardware (some of which remains intact at the ceiling level of emplacement two, Battery Construction #129) helped speed the erection of the formwork. Surfaces were not parged because the shuttering itself tended to leave a more handsome and finished appearance. Some horizontal surfaces were rendered with a cement-rich mixture that left a smooth, almost lustrous surface that was unbroken by flags, while other floors were completed in a manner that was similar to earlier practices.

One of the results of early concrete construction was an unusually porous mass, and there were many efforts to control water penetration and to encourage run-off. These efforts could leave visible marks on the defenses, and they are an important aspect of their history as structures. While many surface coatings were tried, the one that is the most evident today is tar, and many horizontal surfaces retain surviving flecks and splotches of the tar layer. The introduction of the Taylor-Raymond ammunition hoists in 1904 brought about significant modifications to many existing batteries, including the addition of layers of new concrete over the old. The event was an opportunity for greater efforts at waterproofing, and sometimes layers of sheet lead or tar were incorporated into the modifications; Battery Godfrey contains exceptionally clear evidence of the practice. The forward slope of Battery Godfrey also depicts an example of an informal response to the need to promote surface drainage as well as to build up the surface of a settled mass. Drains of iron pipe with an in-fill of local clay saturated with oil or asphalt are the distinguishing marks of an expedient repair to a permanent structure.

Painted surfaces are also a character-defining feature, and paint was applied on both the exterior and the interior. In most early batteries, interior painting schemes were simple, often little more than a white ceiling and upper walls, with black lower walls (Plate 16). The result was a more reflective surface that made the most of the limited lighting in place, coupled with one that hid dirt and scuff marks that were inevitable during use. Exterior colors served to dull the surface of new concrete, which could be almost white in bright sunlight. The painting of Battery Duncan was an exception, and the upper walls of the tall traverse were rendered in red to better match the clay of its building site.[7] Battery Duncan also contains the fading evidence of another feature once common in coast defense practice—the painting of a time-range grid on a traverse wall where it could be seen by the gun crew.

Other less prominent materials also contribute to the character of the defenses. Wood, bronze, ferrous metals, and clay tile all served their own particular purpose and were part of the composite.

Bronze frequently found use in hinge-pins, and was typically cast into a unit that could be incorporated into a structure during its construction. Although the doors are missing in some places, the bronze hinge-pins remain intact, except in those places where they have been robbed out of the structure for their salvage value. Battery Spencer bears ample testimony to the practice. Door closures, where they remain, can also be bronze.

The most readily visible use of wood is in the heavy doors that close most of the entrances. A wooden door built of layers of tongue-and-groove boards, and held together with iron straps and through-bolts was a typical feature of early magazines and gun emplacements from the 1870s through the initial years of the Endicott period. They were not a universal success, and the intent was to replace them with riveted doors of iron and steel.[8] Newer construction included metal doors, and as a result an addition to an older battery (the power room at Battery Saffold, for example) would carry doors of metal while the balance of the battery retained the original wooden versions. Fewer wooden doors were replaced in the San Francisco defenses than elsewhere, perhaps because the generally benign climate was more favorable to their continued good condition (Plate 17).

Wooden boards set high on the interior walls of concrete emplacements provided a fastening surface for the brackets that held electrical wiring, and wooden wiring chases were a common feature of many Endicott and Taft structures, particularly in fire control buildings. Wood-framed Sewell buildings (a type

Plate 16. The simple contrasting color scheme of black and white was basic to early concrete fortifications. This interior view of Marcus Miller also shows the round-arched ceilings that were also typical of the first construction work of the 1890s.

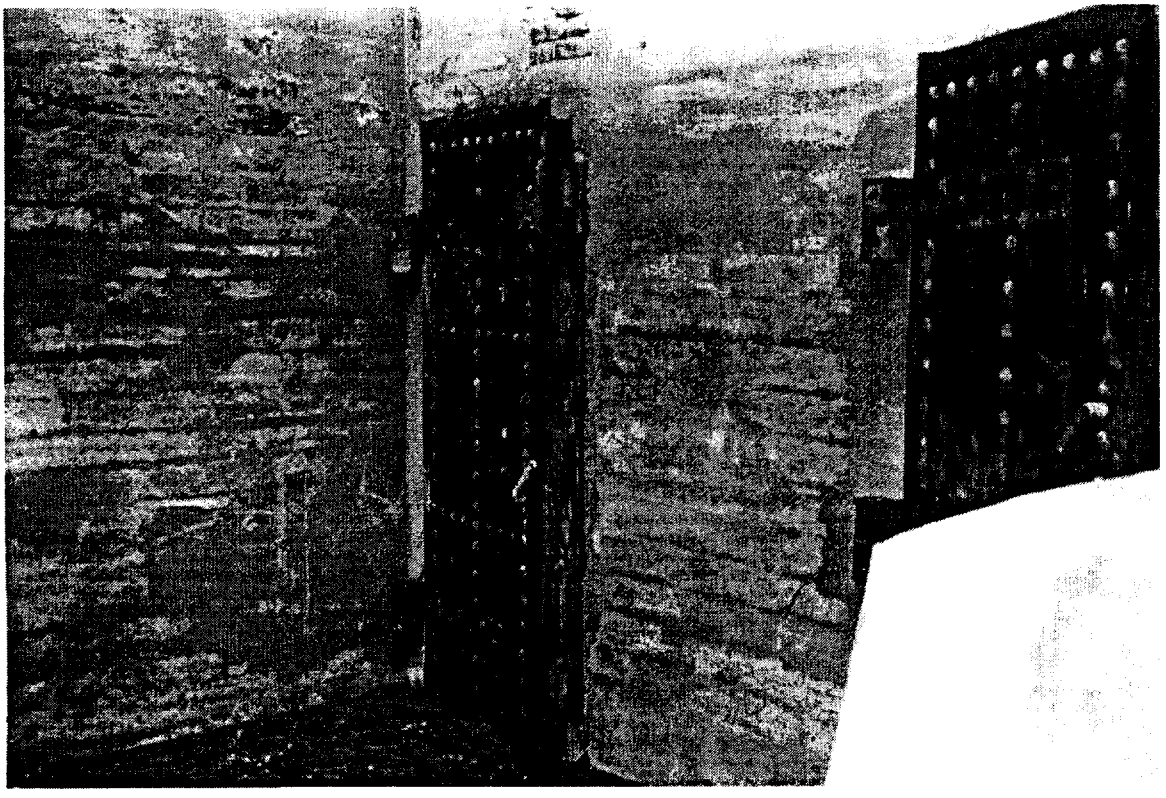

Plate 17. The steel doors and window closures of Battery Dynamite are among the most massive in the defenses, and may indicate the replacement of original closures when this portion of the battery was converted to a telephone switchboard.

of construction that called for cement plaster over expanded metal lath) were used for many auxiliary purposes in coastal fortifications, although none have been identified to date in the San Francisco defenses. The latrines built for Batteries Stotsenburg-McKinnon and Duncan were probably of Sewell construction; the concrete floors and partial walls are all that remain today. Wood plaques also carried identifiers for speaking tubes (Battery Crosby has one such plaque in place, although it is heavily damaged and unreadable) and doors. Wooden window sash is also a common feature of the early San Francisco defenses, although they were less frequently used in other locations of the same time period. During the World War II period, wood found employment for the interior doors and partitions of the Fort Barry mine casemate, the combined mine casemate at Baker Beach, temporary magazine doors at Battery Construction #129, and other locations.

Features of iron and steel are an expected component of fortifications. They are character-defining because of their intended purpose, but also because they help moderate what would otherwise be a plane of concrete; in addition, they often contain a level of detail that is otherwise absent from the structures. Most prominent and already mentioned are the heavy doors, both single- and double-leaf, but also important in their ability to add detail to fortifications are the shutters in observation stations and telautograph booths, ceiling beams and reinforcing bars, trolley I-beams, lighting fixtures, curved pipe railings (Battery Kirby), ladders (Battery Boutelle), stairs (Battery Marcus Miller), gates (Battery Construction #129 and Battery Townsley), stanchion and chain railings (Battery Stotsenburg-McKinnon), window grilles (Batteries Mendell and Duncan, as well as others), ventilator openings (Battery Crosby), and components of ammunition service and supply. Many of the elements are damaged or in some cases missing altogether, and their current state helps promote the sense that the fortifications are of little historical value (Plate 18).

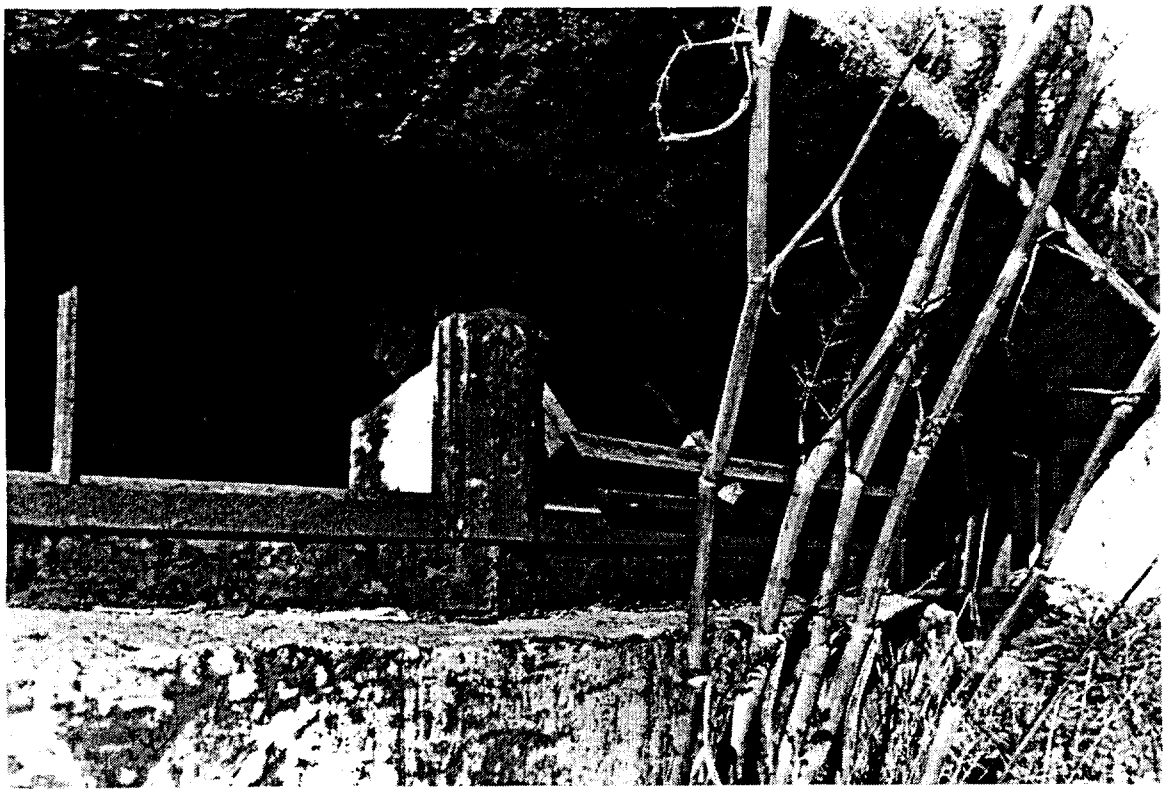

Plate 18. Metals—usually bronze, iron, and steel—served may specialized uses in fortifications, such as this tilting sash at the BC Station, Battery Construction #129.

Clay tile appears as electrical ductwork (an unusual example is in the ramped passage of emplacement three, Battery Godfrey) and as a sub-surface applique to help move water away from concrete walls. That use carried through World War II. Clay tile also appeared in one visually distinctive and widely used form, and it apparently has but one surviving example. Roof ventilators in concrete structures that served auxiliary purposes (power plants, plotting rooms, storage battery rooms, latrines, and so on) were often fitted with a decorative clay cap. These were always fragile, and today all are gone save one, and it is perhaps the most unlikely survivor of all. In the gardens that have been built in the remnants of Battery Lancaster, the single example of a "Mandary" flue cap stands among the plantings, its pagoda-like form making it appear to be a consciously selected element of the landscape.[9]

Structure

Principal Character-Defining Features

Each of the three major periods of construction—1870s, Endicott-Taft, and World War II—produced structures that characterized the style of fortifications then in force. The structures, and the collections of multiple structures, ranged from simple forms in the 1870s, to complex in Endicott-Taft, and to sophisticated in the final years of coast defense.

Change Over Time

The basic character of the fortifications of the 1870s emphasized their impermanence and their place in military architecture as transitional designs. Although West and East Batteries were little more than enhancements on the hastily built works of the Civil War, more regard needs to be given to Cavallo Battery. As mentioned earlier, its character devolves from the material used in its construction, but with its salients and parapet enclosing the entire work, it was also self-defensible. That capacity was unique among the other coastal fortifications of the 1870s, and the battery was arranged in that manner because of its isolated location. Its articulate combination of slopes and angles have been called handsome, and few can fail to be impressed by this singular structure.[10] The architectural quality of Cavallo Battery places it with that small group of fortifications that are recognized and valued by the general public, an aspect that is enhanced by the emergence of its conspicuously artificial form from the surrounding terrain.

The work of the Endicott and Taft boards produced a dizzying variety of structures with an equally diverse catalog of character-defining features. For gun and mortar batteries, the major features are in the plan, the program contained by the plan, and the external form. The time of the design—whether it was done before or after 1900 —also had a particular influence on the appearance of gun batteries.

The large-caliber gun batteries in San Francisco were among the first designs to be put into concrete, and Batteries Marcus Miller and Godfrey are good examples of early floor plan designs. The interior plan was simple, and consists basically of narrow rooms that seem to be little more than spaces hollowed out of the concrete mass for the storage of projectiles and powder. A single passageway, also narrow, led into the shot room, which itself connected to a forebay that linked the powder room to a small hoist shaft leading to the exterior. The passageway was long, in the case of Battery Godfrey some forty feet, but about half that distance in Battery Marcus Miller. The passageways were the principle entry as well as serving as the galleries for ammunition supply. Moving ammunition into Marcus Miller was direct since the entry gallery was at the same elevation as the roadway behind it. That same movement was more difficult at Battery Godfrey because there the entry passageways were at the foot of a long, narrow, and comparatively steep ramp that led below the road elevation. Considering that the projectiles fired by the

Plate 19. Tramways with turntables at intersections carried small rail cars that could be pushed by several men to carry ammunition into the interior of a battery. They were an uncommon feature of fortifications built in the United States. Battery Stotsenburg-McKinnon.

12-inch guns of the battery weighed a half-ton each, moving them down the ramp and into the magazine must have been a tedious and difficult requirement to meet (Plate 19).

The plans of Endicott batteries shifted as engineers began to see more efficient ways to meet the needs of the artillery service, and understanding the evidence of that pattern of change is key in a comparative evaluation of individual batteries. As an example, Battery Saffold is also an early battery, designed in 1896, and it reveals a shift in floor plan that underscores change as an early constant. The entryway at Saffold is a true circulation corridor, and the magazine spaces open onto the corridor, each with its own entry. There was also an additional room in the interior; called a bombproof, intended for shelter during bombardment, and its inclusion demonstrates the desire for more specialized spaces within the battery interior.

While changes in the nature of the interior floor plan may be difficult to perceive in structures whose interiors are not accessible, the exteriors contain a great many examples of improvements made after their initial construction. Almost all major caliber gun batteries show the effect of additions and other improvements. Not long after Batteries Marcus Miller and Godfrey were completed, the artillery officers complained that they did not offer all the space that was necessary, and engineer officers had their own list of changes they wanted to make as well. As a result, small separate structures were tacked onto the new batteries. On the right rear of emplacement three of Battery Marcus Miller, the engineers situated storerooms, a latrine, and a motor-generator room; they also added a plotting room behind emplacement one. Engineers built a similar collection of rooms into a much more constricted space between the right side of Battery Godfrey and a retained 1870s magazine. In much the same vein, the magazine space of the same battery was expanded by the addition of a large room; the windows of the enlarged magazine are visible at the rear of the battery.

There were other conspicuous changes as well. Between 1904 and about 1912, all the big gun batteries underwent further modifications that brought them closer to the appearance they have today. The greatest impact came about as a result of modifications to the method of delivering ammunition from the magazine to the emplacement above. The hoists installed when the batteries were first constructed were limited in many ways, and in 1904, the Army began a nationwide program to upgrade the ammunition delivery service. They installed a new mechanism called a Taylor-Raymond hoist, which required considerable reworking of most existing gun batteries. Old hoist shafts were closed, new shafts were cut through mass concrete, space was created for the new hoist mechanism in the magazine, and a heavy concrete roof called a splinterproof was built over the top of the replacement hoist. At about the same time, special booths (to house a distance writing instrument called a telautograph) were built to the rear of many emplacements, and extensions were added to some loading platforms. Earth was removed from the rear of the traverses of Marcus Miller and Godfrey, permitting movement between the loading platforms of adjacent guns for the first time since the batteries were built. The final conspicuous change came when the battery commander's stations were added to most gun batteries.

Battery Spencer shows best the changes that could be brought about by the collective improvements. Because of the compressed and angular plan, the battery parade is more like a courtyard, and it is easier here than it is at other batteries to see the net effect of the changes from a single position. The tall telautograph booth, the free-standing truck recesses, the small platform extension at emplacement one, the battery commander's station, and the Taylor-Raymond hoist positions with their thick concrete covers, all indicate improvements to the battery to keep it modern and useful. This battery too had its complement of out-buildings to make up for specialized spaces not foreseen when the battery was first designed. There was so little room on the site that these new structures had to be fitted into either side of the approach road, forming a corridor for visitors today.

After the enhancements of the Taft board had been considered and put into place, the construction of fortifications effectively came to a halt until the advent of World War II. There was some modest activity, and Battery Wallace was one of the few projects built in the United States after World War I. While it appears to be wholly unrelated to features common in Endicott works, Battery Wallace and others like it were the natural outgrowth of the designs that took shape at the turn of the century.

The fundamental character-defining feature of the first concrete batteries was a two-story appearance. The magazines were on the first or ground floor, and the gun above was on a higher level with the ammunition hoist connecting the two. That was never a wholly satisfactory design for a number of reasons, and after much experimentation, the engineers were able to do away with the hoist and it became possible to place ammunition storage and the gun on the same level. Battery Wallace, a later version of that idea, was built for a different type of gun, but it contained an equally dramatic element that set it and later batteries aside from what had been built before. They were now to be single-story structures. The guns were widely separated from each other, and the magazines and storage spaces between the guns were covered with a heavy layer of earth (Plates 20 and 21).

Battery Wallace, Battery Davis, Battery Construction #129 and others like them, are the culmination of what had been learned during the construction of the Endicott and Taft periods. Where plotting rooms, power plants, latrines, store rooms, and guard rooms had been added onto the exterior of the gun batteries of the 1890s, later designs of that period (Battery Mendell) had incorporated those features into the floor plan at the outset. It was only natural that all of those elements would be in place when the next generation of coast defenses came to be built. The character-defining feature of these plans was efficiency, and the visual quality was characterized by a subtle appearance that made them seem more a part of the landscape. In some ways, the designs had come full circle, the works of World War II bearing similarities of form to those of the 1870s. Missing from that assessment is the acknowledgment of the

sophistication of these last fortifications, for they represented the conquest of many of the problems of design and construction experienced in the first generation of concrete fortifications.

Linking Analysis to the Coast Defense Resource Checklist

The major divisions of this chapter—Location and Site, Construction Materials, and Structure—also form the core of the Coast Defense Resource Checklist. The checklist is the device by which much of the content of this manual is conveyed to the resources. Those preparing inventories will have to be alert to the variable nature of fortification structures and look beyond the brief and comprehensive categories included on the checklist.

The character-defining features of fortifications are often nuanced, surprising in a resource whose most conspicuous aspect is great size. For example, there are many types of railings and rail fittings, and the checklist should note the varieties—or link to another document that catalogs these differences. Failure to identify and acknowledge the importance of such detail can lead to unfortunate choices, such as the replacement handrail at Battery Chester. These details change from one structure to the next. Iron doors may cover ventilation openings in one battery, but a grill might be used for the same purpose in another. Noting both uses is a part of any inventory.

Vegetation poses its own set of challenges. The control of the landscape was presumed in fortification design, especially during the period when aircraft came into military use for observation. Yet few of the landscape decisions made by the builders are recognizable today. Small trees that may have been planted on the slopes of batteries have grown to a maturity they were never intended to reach. Heavy underbrush has effectively destroyed the visible evidence of any original groundcover. The combined effect can often isolate a coast defense structure from a necessary view of the water area, and that view as well is a character-defining feature. The fundamental purpose of plant materials in fortifications was to disguise and obscure the location of a structure, but not at the cost of reducing their effectiveness.

The lesson to be learned from this chapter is that the successful comprehensive identification of character-defining features moves from the general to the specific. The general is included on the Coast Defense Resource Checklist, but the specific must remain in the hands—and eyes—of those who will complete the forms.

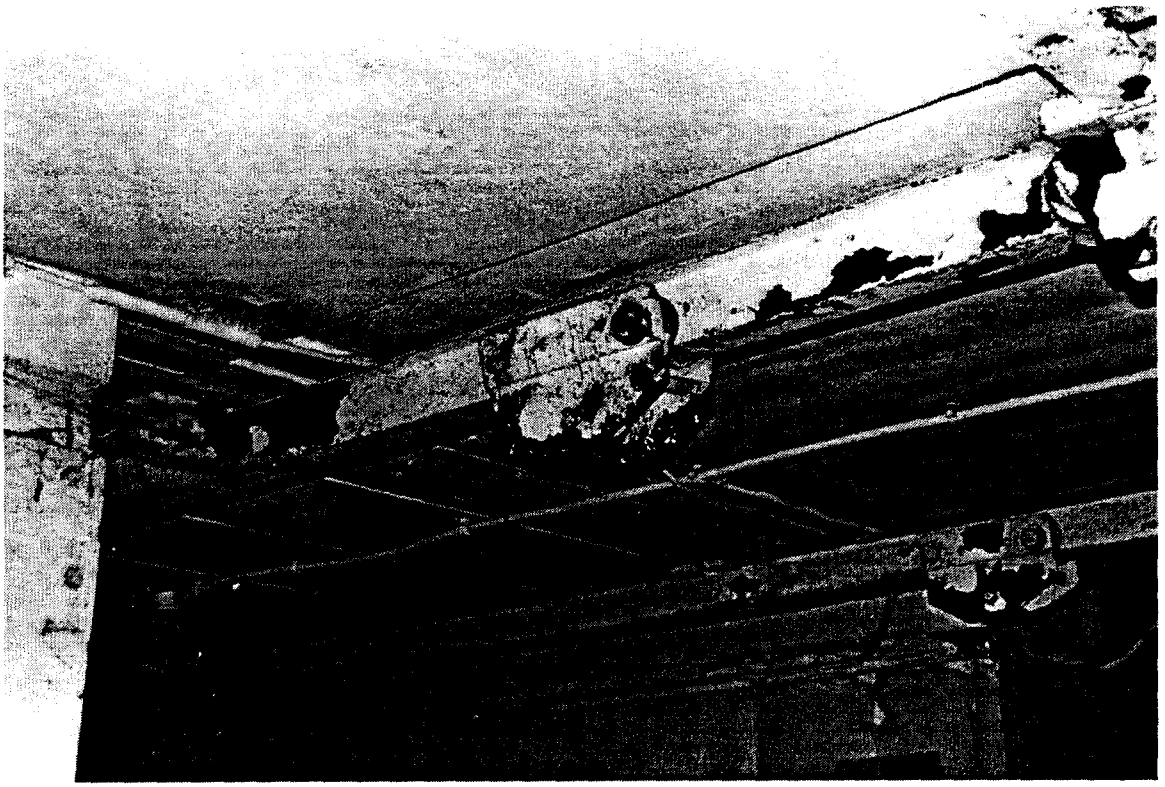

Plate 20. Almost all mortar batteries featured ceiling trolleys for delivering ammunition to the exterior of the emplacement. Trolleys found the same use in batteries for large-caliber guns, but there they led to an ammunition hoist. Battery Stotsenburg-McKinnon.

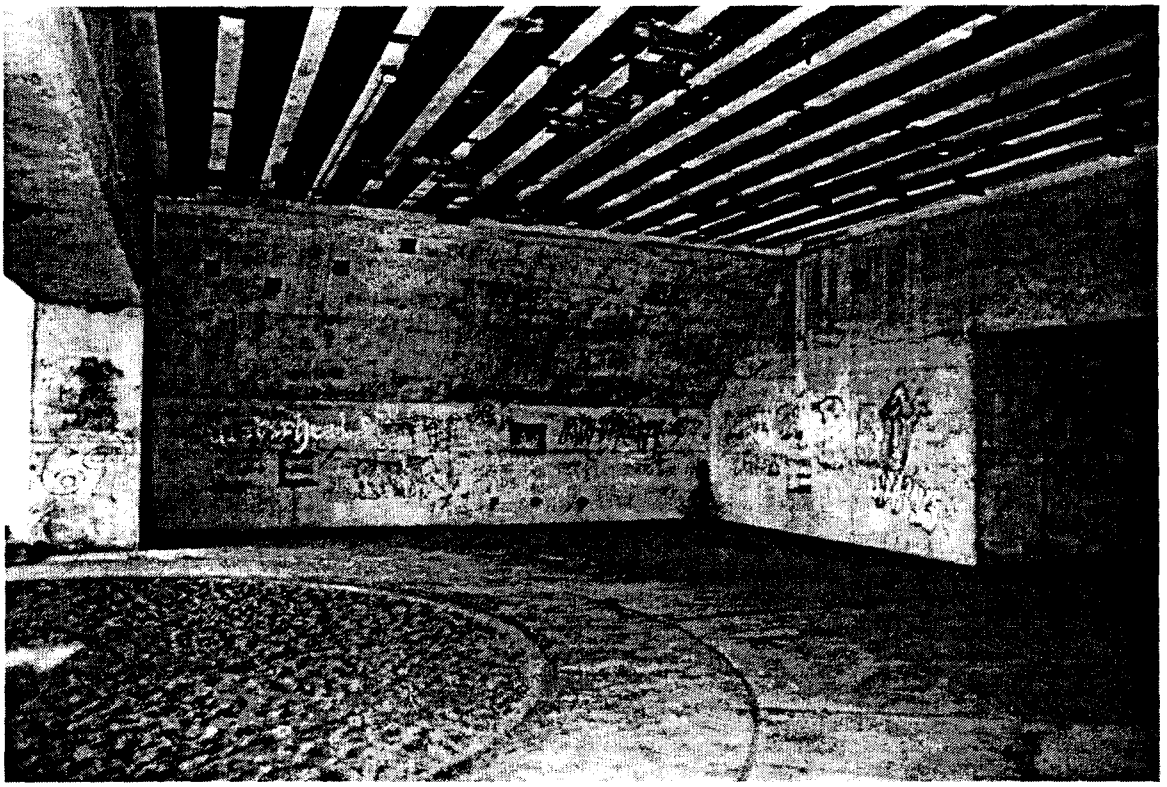

Plate 21. Ceiling trolleys were efficient, and they were also out of the way, leaving ample space in the battery. Fastenings for overhead trolleys dot the ceiling of emplacement one, Battery Wallace.

[1] U.S. Army Corps of Engineers, Board of Engineers, *Mimeograph No. 102*, "Storage of implements, etc., at emplacements," 16 January 1907. Hereafter cited by mimeograph number, title, and date. Erwin N. Thompson, *Historic Resource Study, Seacoast Fortifications, San Francisco Harbor, Golden Gate National Recreation Area* (Denver: U.S. Department of the Interior, National Park Service, 1979), 93.

[2] *Mimeograph No. 2*, "Memoir of Mortar Battery No. 1, Fort Point, Cal.," 30 September 1895.

[3] San Francisco's port, as essentially a gap in an unbroken coastal scarp, made defense in depth more difficult. In the case of San Francisco, defense in depth was accomplished by the creation of mine fields and covering batteries *inside* the harbor entrance, a less than satisfactory solution. At other locations, local geography allowed the use of more numerous headlands and islands *outboard* of the harbor mouth. A well-maintained navigation channel through shallow water at still other locations also helped govern the nature of approach for any attacking fleet. These advantages are not present at San Francisco.

[4] U.S. House of Representatives, *Annual Report of the Chief of Engineers, United States Army, to the Secretary of War*, 1895, 517.

[5] Watson and Henry Associates, "Concrete Stabilization, Battery Gregg and Postern Tunnel, Fort Mott State Park," project specifications, 17 February 1995.

[6] Keith Mallory and Arvid Ottar, *The Architecture of War* (New York: Pantheon Books, 1973), 281.

[7] U.S. House of Representatives, *Annual Report of the Chief of Engineers, United States Army, to the Secretary of War*, 1899, 987.

[8] *Mimeograph No. 64, 16th endorsement*, 19 June 1903.

[9] *Mimeograph No. 48, 42nd supplement*, "Brick switchboard room, type B, at Fort Totten, N.Y.," 16 December 1907, sheet 3.

[10] Thompson, 106.